OCR
Oxford Cambridge and RSA

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Friday 16 June 2017 – Morning

GCSE GATEWAY SCIENCE
ADDITIONAL SCIENCE B

B722/01 Additional Science modules B4, C4, P4 (Foundation Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 30 minutes

* B 7 2 2 0 1 *

* 6 7 5 2 0 2 0 2 8 8 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The Periodic Table can be found on the back page.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **85**.
- This document consists of **24** pages. Any blank pages are indicated.

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

$$\text{efficiency} = \frac{\text{useful energy output } (\times 100\%)}{\text{total energy input}}$$

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

distance = average speed × time

$$s = \frac{(u + v)}{2} \times t$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

power = force × speed

$$KE = \frac{1}{2}mv^2$$

momentum = mass × velocity

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

GPE = mgh

$$mgh = \frac{1}{2}mv^2$$

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

Answer **all** the questions.

SECTION A – Module B4

1 This question is about decay.

(a) Food preservation techniques **reduce** the rate of decay.

Which **two** conditions **reduce** the rate of decay?

Put ticks (✓) next to the **two** correct answers.

adding light ☐

adding oxygen ☐

adding sugar ☐

adding vinegar ☐

adding water ☐

[2]

(b) Decay is useful to farmers because they use it to break down plant waste.

What is formed when plant waste decays?

Put a (ring) around the correct answer.

chlorophyll **compost** **oxygen** **sewage** **starch**

[1]

(c) What types of living organisms cause decay?

.....

..... **[2]**

2 **(a)** Mites are small animals that are similar to spiders.

Some mites are pests that eat farmers' crop plants.

Some farmers use insects that are predators to kill the mites.

The table shows information about four species of predator insects, **A**, **B**, **C** and **D**.

Predator species	Temperature the predators are most active at in °C	Relative humidity the predators are most active at %	Number of mites eaten by predators each week, in ideal conditions	Which part of the predator life cycle eats the mites
A	21 – 27	> 60	300	larva and adult
B	18 – 26	40 – 80	500	larva only
C	5 – 16	> 50	425	larva and adult
D	26 – 35	40 – 50	350	adult only

Sue is a farmer. She grows crop plants inside a glasshouse.

There are mite pests living on her crop plants.

In her glasshouse

- the temperature is kept between 20 and 25 °C
- the relative humidity is kept between 50 and 60%.

Look at the table.

Which predator species will be the best one for Sue to use to kill the mites?

Choose from **A**, **B**, **C** or **D**.

Explain your answer.

predator species .....

explanation .....

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.....

.....

..... **[3]**

(b) What term describes the use of predator insects to kill mite pests?

Put a tick (✓) next to the correct answer.

adding pesticides ☐

battery farming ☐

biological control ☐

crop rotation ☐

hydroponics ☐

[1]

(c) Using predator insects is one example of an **organic** farming method.

Some farmers use **intensive** farming methods.

How are organic farming methods different from intensive farming methods?

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..... **[2]**

(d) The table shows some statements about organic farming.

Some of these statements could be tested scientifically.

Some of the statements are just opinions that could **not** be tested scientifically.

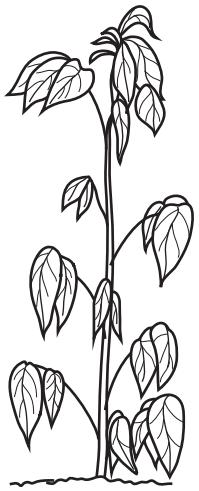
Put **one** tick (✓) next to **each** statement to show whether it could be tested scientifically or whether it is just an opinion.

Statement about organic farming	Could be tested scientifically	Just an opinion
Causes less water pollution than intensive farming.		
Is more natural than intensive farming.		
Produces food that is more expensive than food produced by intensive farming.		
Produces less food from the same amount of land as intensive farming.		

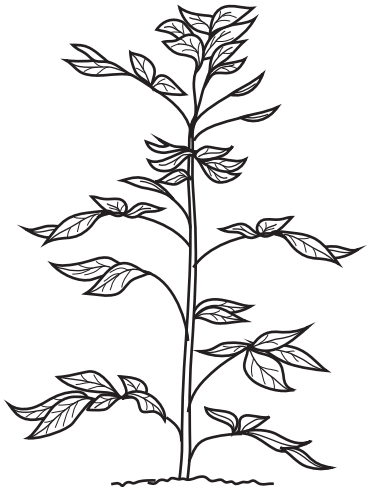
[2]

3 Sam has a plant growing in his garden.

He notices that it changes its appearance after there is a lot of rain.



Before the rain, the plant is drooping.



After the rain, the plant is **not** drooping.

Explain what happened to the plant **after** it rained.

In your answer include

- the names of any processes involved
- the names of any parts of the plant involved.

The quality of written communication will be assessed in your answer to this question.

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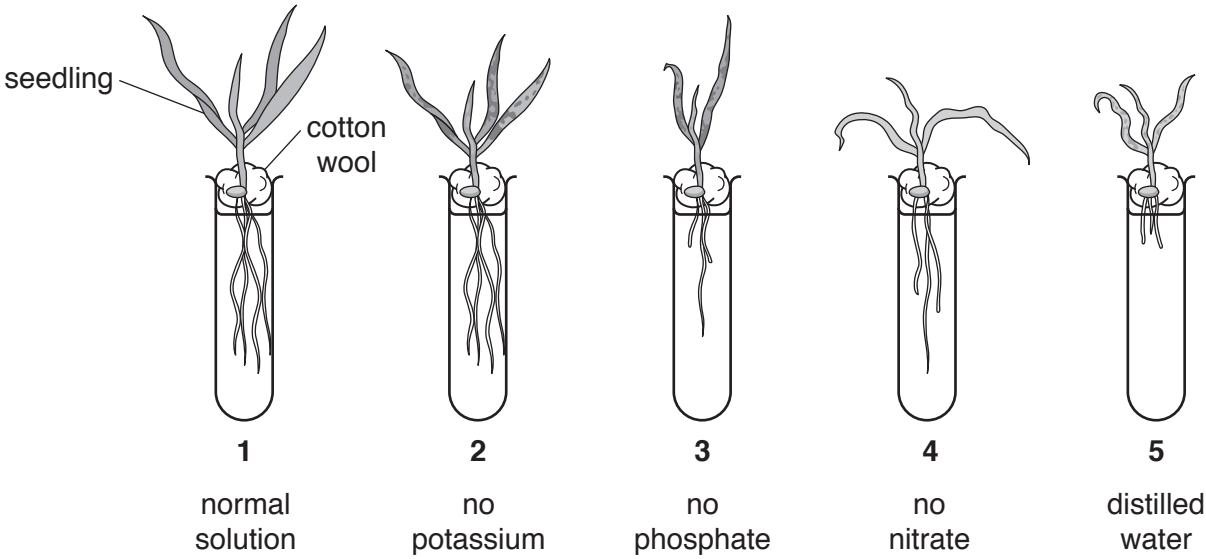
..... **[6]**

4 Liz is investigating why plants need different minerals.
She puts some seedlings in different solutions to grow.

Test tubes **2**, **3** and **4** are each missing a different mineral.
The distilled water in test tube **5** contains no minerals.
Liz makes sure that the seedlings all get the same amount of light and are kept at the same temperature.

The diagram shows the seedlings after four weeks.



(a) What would be in the normal solution in test tube **1**?

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..... **[2]**

(b) Explain the results for test tube **3**.

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..... **[2]**

(c) In which seedling will most photosynthesis happen?

Explain your answer.

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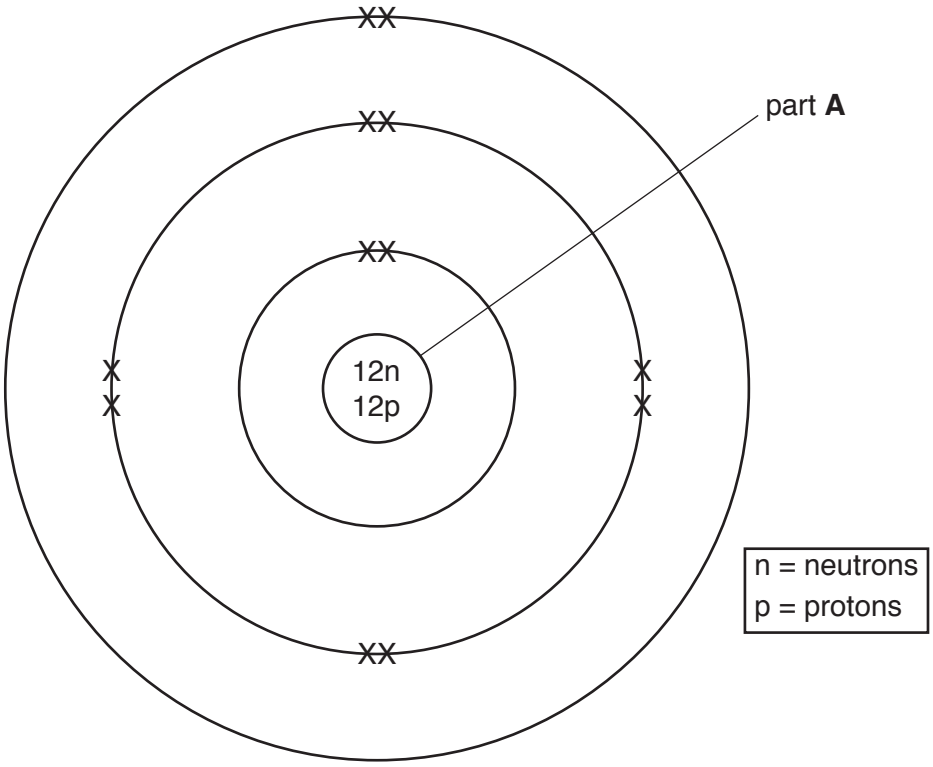
..... **[2]**

SECTION B – Module C4

5 Look at the diagram of the structure of an atom of an element.



(a) What is the name of part **A**?

..... **[1]**

(b) What is the **atomic number** of this element?

..... **[1]**

(c) What is the **mass number** of this element?

..... **[1]**

(d) How many occupied **shells** does the atom have?

..... **[1]**

(e) The element has several **isotopes**. This atom is one of these isotopes.

What is meant by the word isotopes?

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..... **[2]**

6 Phil tests two unknown solutions, **A** and **B**, with

- silver nitrate solution
- sodium hydroxide solution.

Look at his table of results.

Solution	Effect of silver nitrate solution	Effect of sodium hydroxide solution
A	white solid	blue solid
B	stays the same	grey/green solid

Phil makes two conclusions.

- Solution **A** contains chloride ions.
- Solution **B** contains iron(III) ions.

Do Phil's results support each of these conclusions?

Explain your answer.

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..... **[2]**

7 Peter investigates the decomposition of carbonates using the internet.

Look at the information that he finds.

Carbonate	Decomposition temperature in °C
calcium carbonate	875
copper carbonate	250
iron carbonate	375
magnesium carbonate	500
barium carbonate	1375

(a) Copper carbonate decomposes to make copper oxide and carbon dioxide.

(i) Write the **word** equation for this reaction.

..... **[1]**

(ii) Describe the chemical test for carbon dioxide.

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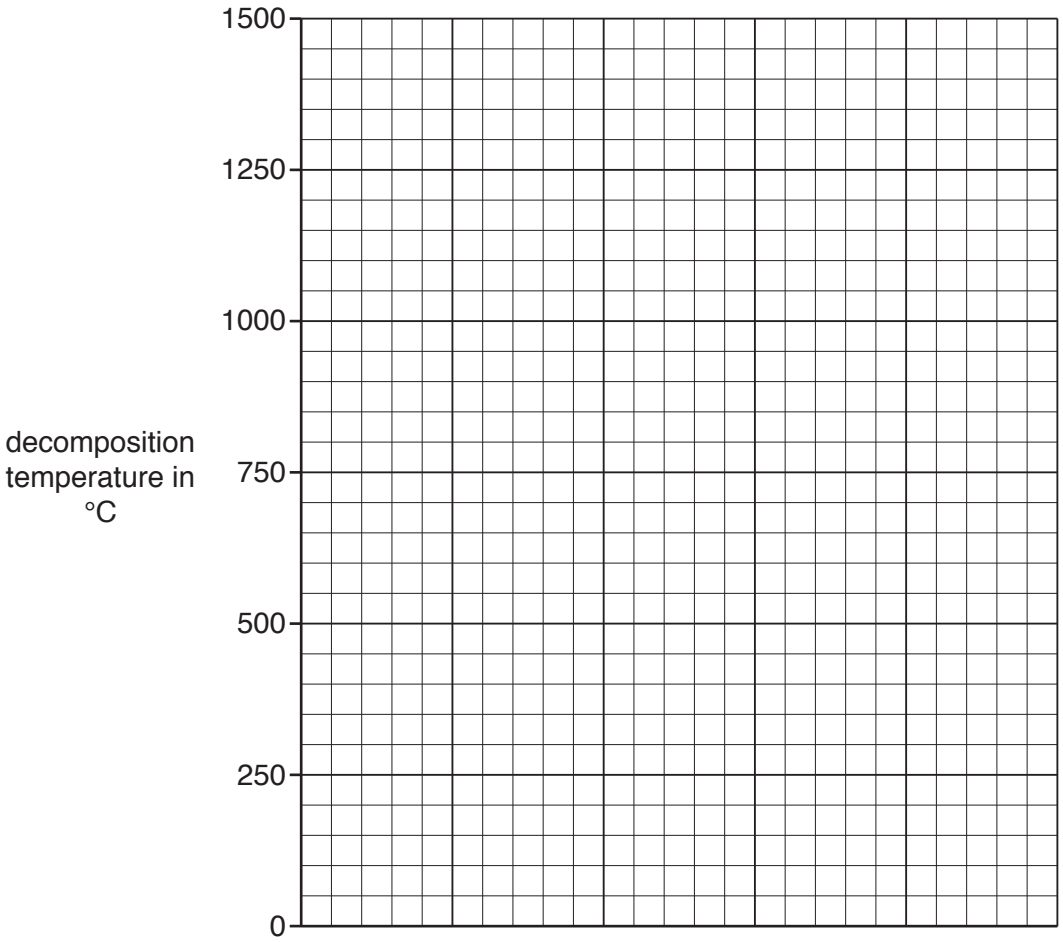
..... **[2]**

(b) Peter wants to present the data in the table in another way.

Present the data on the grid.

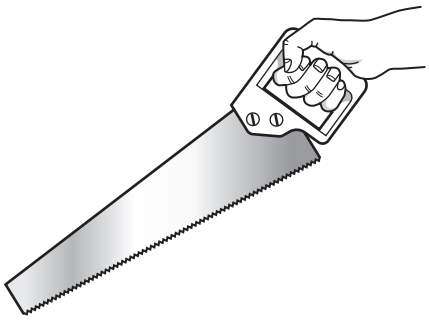


[2]

8 Iron and steel are typical metals.

Iron and steel are good conductors of heat, have a high density and are hard.

Iron and steel are used to make cutting tools called saws.



Describe **four other** physical properties of metals.

Explain why iron and steel are suitable to make cutting tools such as saws.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

9 An element has an **atomic number** of 47.

(a) Use the Periodic Table to write the **name** of this element.

..... **[1]**

(b) Is this element a **transition element**?

Explain your answer. Use information from the Periodic Table.

.....

..... **[1]**

10 Chlorine and iodine are two elements in Group 7.

(a) Describe **one** use of chlorine and a **different** use of iodine.

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..... **[2]**

(b) Look at the list of formulas.

Cl_2

HCl

I

I^-

Which formula is a **molecule** of a **compound**?

Choose from the list.

Explain your answer.

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..... **[2]**

SECTION C – Module P4

11 Ultrasound is used in hospitals.

(a) Put (rings) around **two** uses for ultrasound in hospitals.

Choose from

checking for broken bones

measuring blood flow

measuring temperature

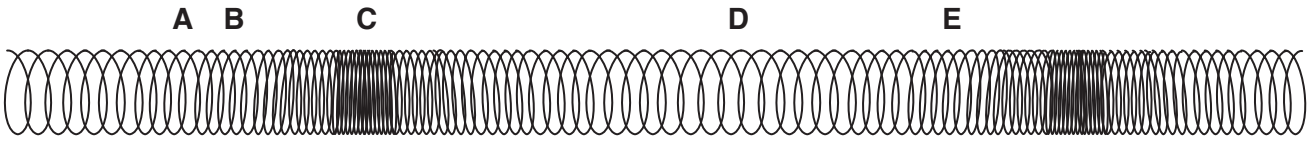
scanning unborn babies

sterilising equipment

[2]

(b) Ultrasound is a longitudinal wave.

A slinky spring can be used to model a longitudinal wave.



Complete the sentences about ultrasound waves.

Choose from **A** **B** **C** **D** **E**

(i) A **rarefaction** is shown by letter ..... . **[1]**

(ii) A **compression** is shown by letter ..... . **[1]**

(iii) The wavelength is between letter ..... and letter ..... . **[1]**

(c) What are the **differences** between sound waves and ultrasound waves?

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..... **[2]**

12 An engineer tests underground pipes to see if they are damaged.

(a) Before testing the underground pipes she measures the radioactivity from the ground.

Look at her results.

Day	Radiations in one minute
Monday	11
Tuesday	12
Wednesday	14
Thursday	10
Friday	13

(i) What is the name of this radiation **and** where does it come from?

.....

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..... **[2]**

(ii) The engineer does **not** get steady readings.

Suggest why.

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..... **[1]**

(iii) Use the results to calculate the **mean** number of radiations in one minute.

.....

..... **[1]**

(b) An underground pipe is damaged.

The engineer uses radioactivity to find out where the pipe is damaged.

She measures the radioactivity every 10 m along the pipe.

Look at her results.

Distance along the pipe in m	Radiations in one minute
0	110
10	108
20	112
30	109
40	190
50	150
60	12
70	11
80	13
90	12

Describe how radioactivity is used to find the damage.

What does the data tell us about the damage to the underground pipe?

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

13 Bill has electrical appliances in his home.

One of the appliances stops working.

(a) He fits a new 3A fuse in the plug.

Why is a fuse used in a plug?

..... **[1]**

(b) Many appliances have three wires in the plug.

This appliance only needs two wires.

Explain why this appliance only needs two wires.

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..... **[2]**

(c) The appliance uses 230V to supply a maximum current of 3A.

Calculate the maximum power of the appliance.

answer ..... unit ..... **[2]**

14 Nuclear power stations produce electricity.

Name the fuel used in a nuclear power station **and** describe the stages needed to produce electricity.

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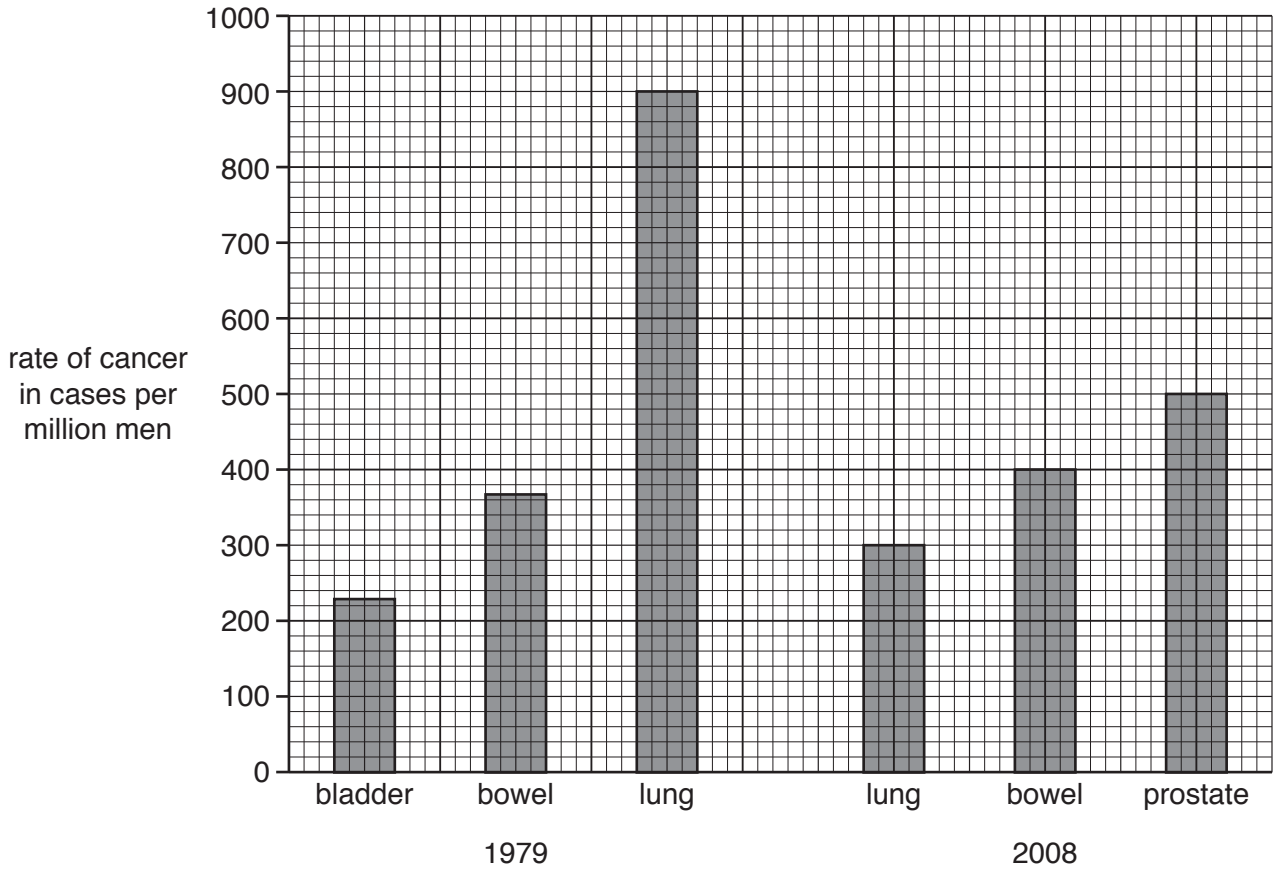
..... **[3]**

SECTION D

15 Radioactive isotopes are used to treat different types of cancer.

(a) The graph shows the rates of cancer in men aged 40–50 in Great Britain.

It shows the rates for the three most common types of cancer in these men in 1979 and the three most common types of cancer in these men in 2008.



(i) Which type of cancer has decreased the **most** in these men between 1979 and 2008?

..... **[1]**

(ii) In 2008 there were 4 million men aged between 40 and 50 in Great Britain.

Calculate how many of these men would be expected to have prostate cancer.

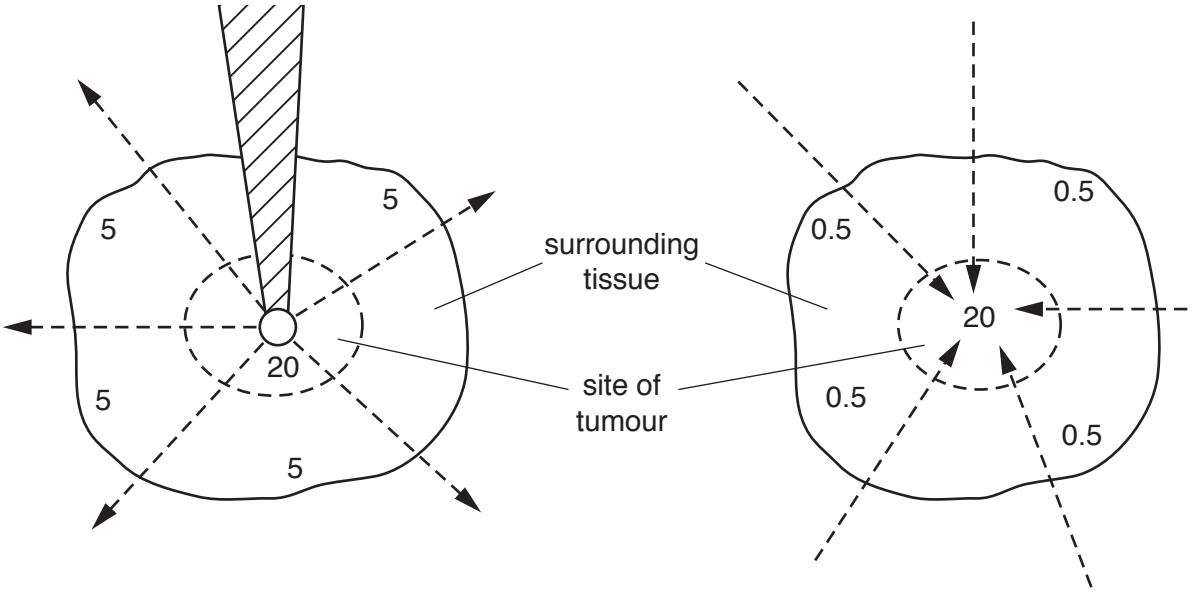
You should show your working.

answer = ... **[2]**

(b) Patients with cancer often have the cancer tissue (tumour) removed.
They are then treated with a radioactive isotope to

- stop the tumour growing back
- stop any cancer cells in the surrounding tissue spreading to somewhere else in the body.

The diagram shows two ways of using radioactive isotopes.
The numbers show the amount of radiation received in different areas.



Method A
The radiation is supplied by putting the isotope inside the tissue

Method B
The radiation is supplied from the isotope outside the body

Compare the amount of radiation received by the cells in different parts of the tissue using method **A** and method **B**.

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..... **[2]**

(c) Doctors designed a trial to compare these two methods of giving radiation.

They used 3000 patients in the trial.

The patients were randomly divided into two groups.

One group was treated with method **A** and the other with method **B**.

(i) Explain why a large number of patients was used in the trial.

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..... **[2]**

(ii) Why were the patients divided randomly into two groups?

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..... **[1]**

(iii) Here are some results from the trial.

	Method A	**Method B**
Number of patients who died from diseases such as cancers elsewhere in the body in the next five years	12	27

Compare the success of the two treatments and suggest a reason for any difference.

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..... **[2]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.